**ANSWERS to Crystal Ball questions on Interpreting equilibrium expressions using the value of K**

**1)** A temperature increase results in a reaction moving towards the endothermic side.

In this particular reaction, the temperature increase to 300 °C resulted in less product being formed because there is only 3 molecules of PQ compared to 5 molecules of PQ at 25 °C and at 300 °C, no atoms of P.

So a temperature increase results in the reaction moving towards the reactants side, therefore the reactants side is the endothermic side so overall the reaction must be exothermic because the forward reaction is exothermic.

**2) a)** $K = \frac{[NO]^4 [H_2O]^6}{[NH_3]^3 [O_2]^5}$

**b)** $K = \frac{(0.1)^4 (0.15)^6}{(0.1)^3 (0.125)^5}$

**c)** The only factor affecting the value of K is temperature, so there will be no change to the value of K for all of the c) answers except c) ii)
**ii)** If the temperature increases the reaction goes towards the endothermic side so if the reaction decreases the reaction goes to the exothermic side. The reaction provided has an enthalpy change of -46.2 $kjmol^{-1,}$ the minus sign indicates that this is an exothermic reaction, so a temperature increase will cause the reaction to proceed to the right or forward. Therefore the value of K will increase because the concentration of products is a numerator in the equilibrium constant expression.

**3) a)** The equilibrium constant value is 3.2 which is larger than one, this means that the concentration of the products (the numerator) will be higher than the reactants (the denominator). So the concentration of trans-but-2-ene will be highest. If the K value was less than one the concentration of reactants would be higher than the products.

**b)** As the temperature increases the K value has decreased. This means the equilibrium has shifted to have more reactants and less products. This would happen if the reaction was exothermic. In exothermic reactions the reverse reaction rate will increase faster than the forward reaction rate when the temperature is increased.

*edited from reference: http://www.glimme.net/bhs/unt09/AP-Q-2-ans.pdf*